Kennedy/Jenks Consultants

Going Underground:

How the City of Longview Changed their Drinking Water Source

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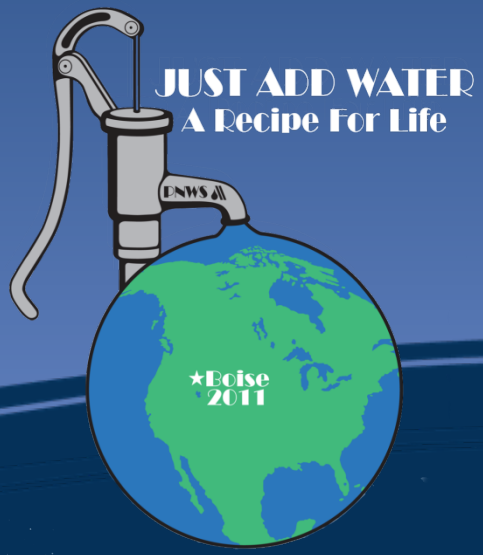


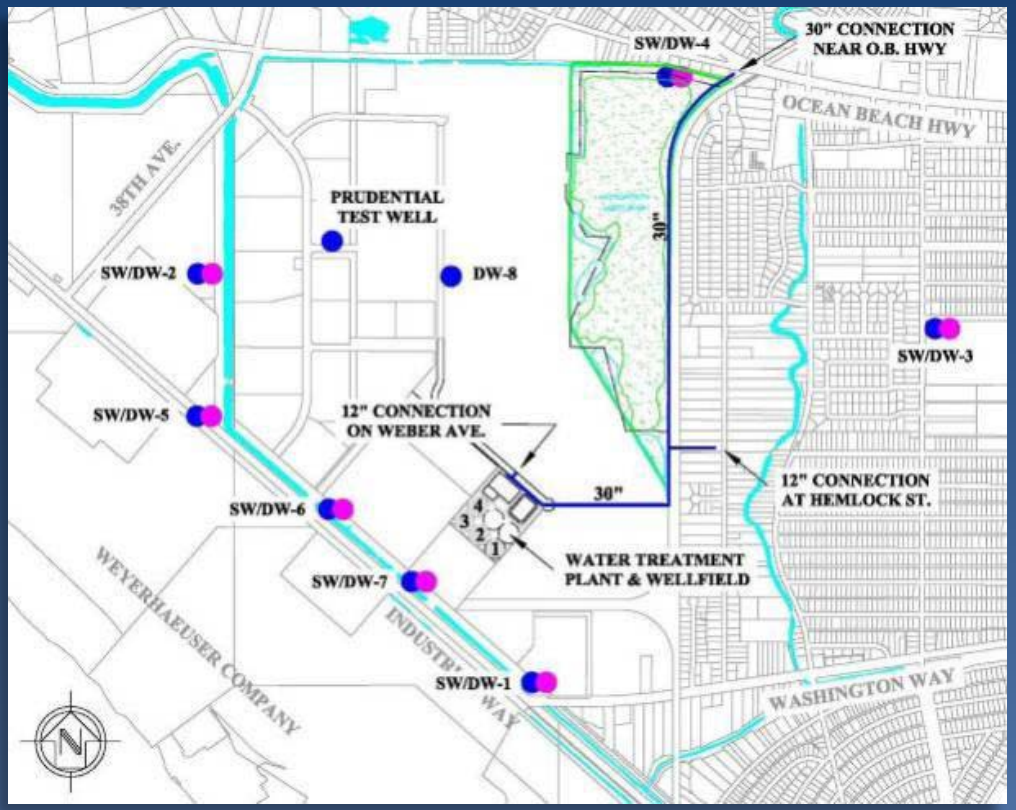
Presentation Overview

- Project background
- Key steps in changing a water source
  - Identify need
  - Evaluate alternative sources
  - Evaluate treatment alternatives
  - Implement a public communication strategy
  - Conduct design, construct facility, start-up
- Questions?

Project Background

Project Location

Project Site Characteristics



Key Steps in Changing a Water Source

- Identify need and stakeholder objectives
- Evaluate alternative sources
  - Determine source water quantity
  - Characterize source water quality
  - Confirm water rights status
- Evaluate treatment alternatives
- Implement a public communication strategy
- Conduct design, construct facility, start-up

Key Step - Identify Need

- Existing RWTP has exceeded its useful life
- Unable to meet current and future demands
- Turbid source with increasingly stringent surface water regulations
- Alternative sources may be more reliable and higher quality
- Higher cost to rebuild existing RWTP versus construct new groundwater facilities

Identify and Screen Alternative Sources

- Potential sources identified and screened:
  - New Columbia River Source – excessive time to obtain permitting – screened out
  - New Cowlitz River Source – prohibitive cost of relocation – screened out
  - Existing Cowlitz River Source - involves rehab of existing Cowlitz River plant – time and cost to rehab prohibitive – screened out but will serve as the “do nothing” alternative
  - New groundwater source – determined acceptable for further evaluation

Key Step - Evaluate Alternative Sources

Evaluation must consider:

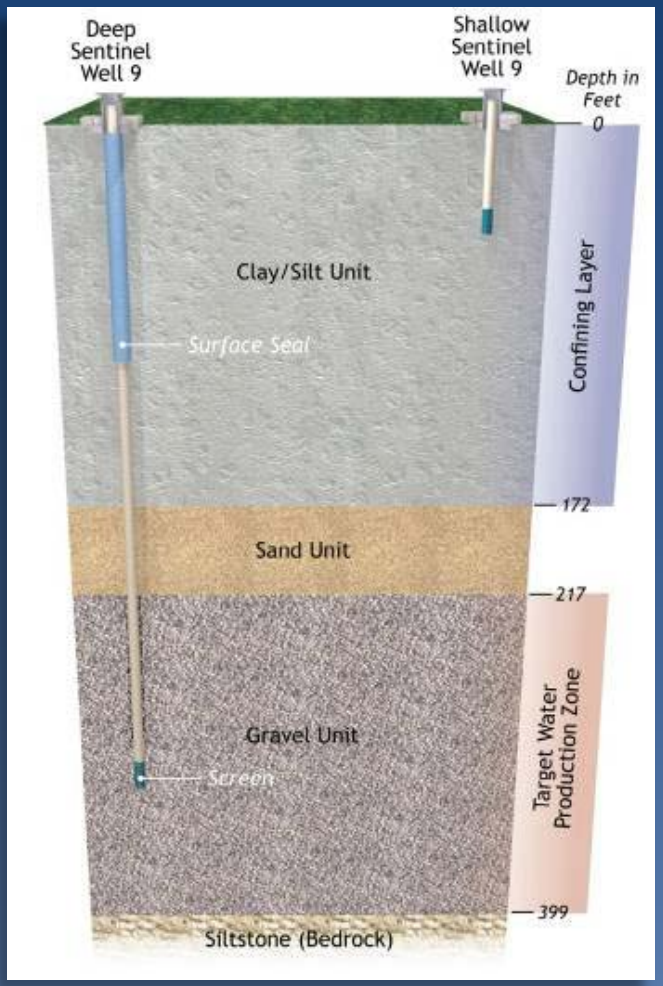
- Adequacy of raw water supply (Hydrogeologic Characterization) – now and later
- Quality of raw water
- Treatability of raw water (ability to meet regulatory requirements)
- Costs of treatment/alternative source: capital, O&M and risk consequence
- Public concerns, expectations and perceptions

Evaluate Water Supply – Hydrogeologic Characterization

Drilling Approach for Characterization

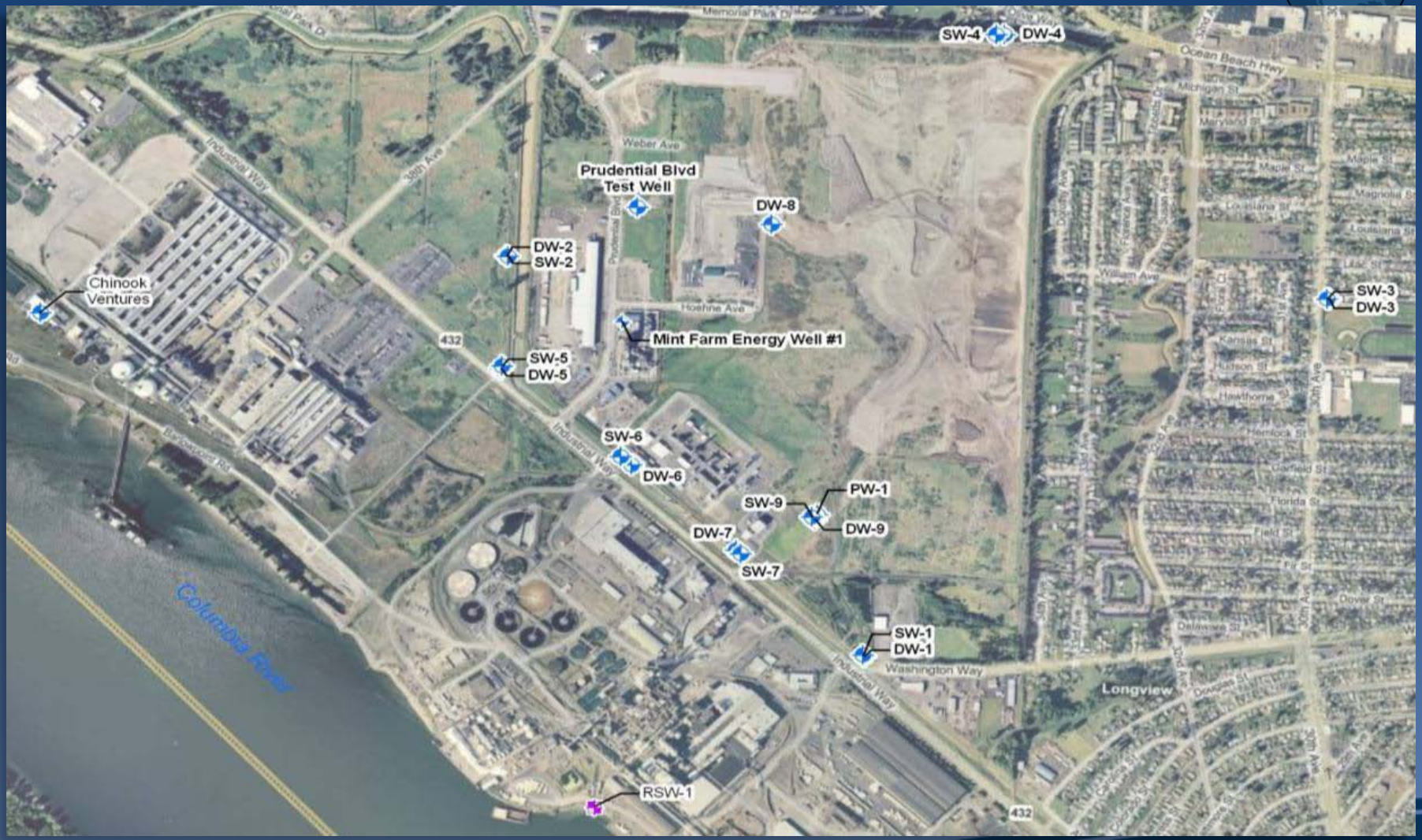
- Sonic drilling technology chosen to provide continuous coring and accurately measure:
  - Thickness of silt/clay unit
  - Hydraulic conductivity values with collection of depth discrete samples
  - Grain size
  - Thickness of target aquifer
  - Depth of bedrock (262-feet to 449-feet)

Characterization Findings



Continuous soil cores revealed a protective confining layer overlying a thick gravel unit ("Target Aquifer")

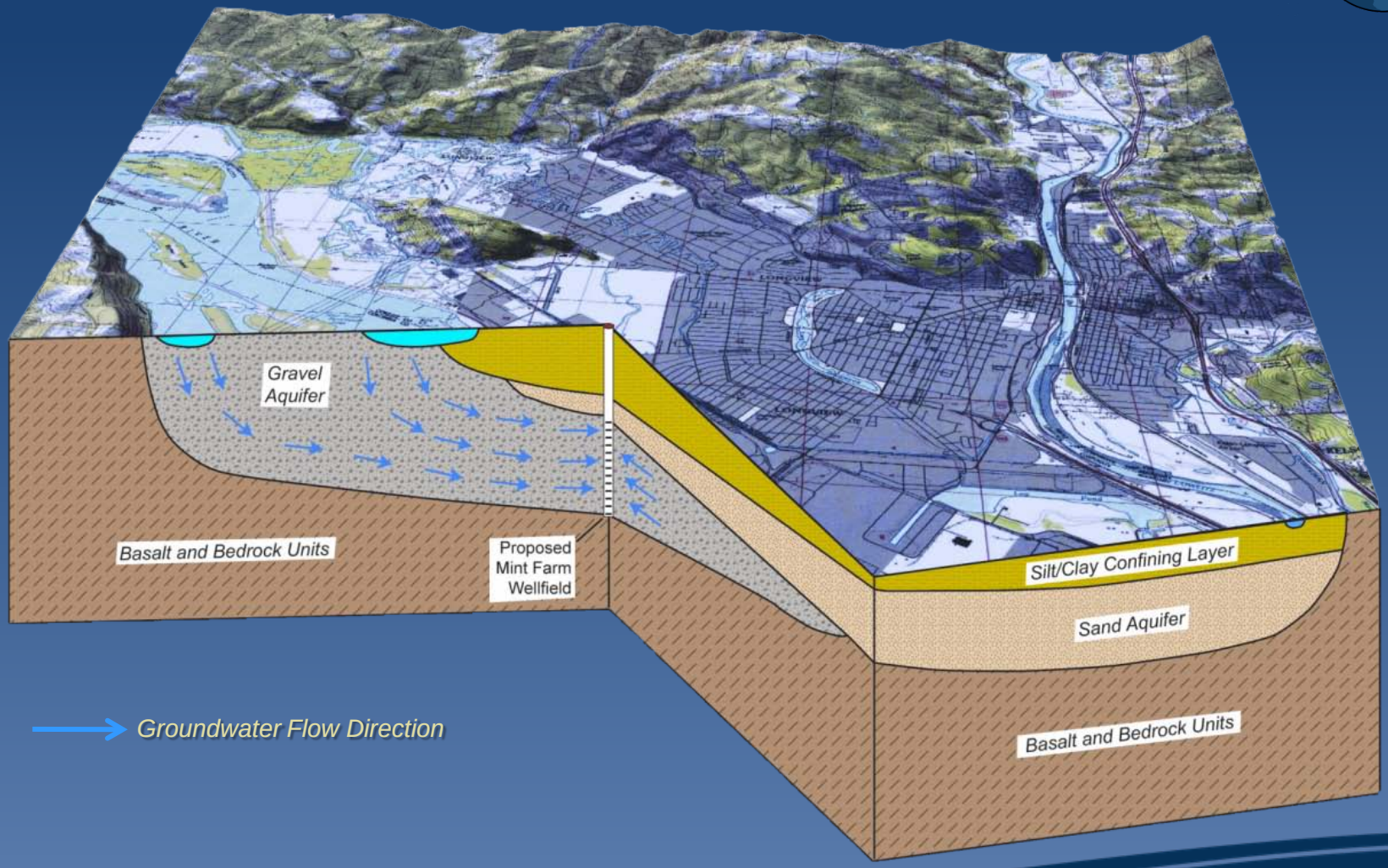
Monitoring Well Locations



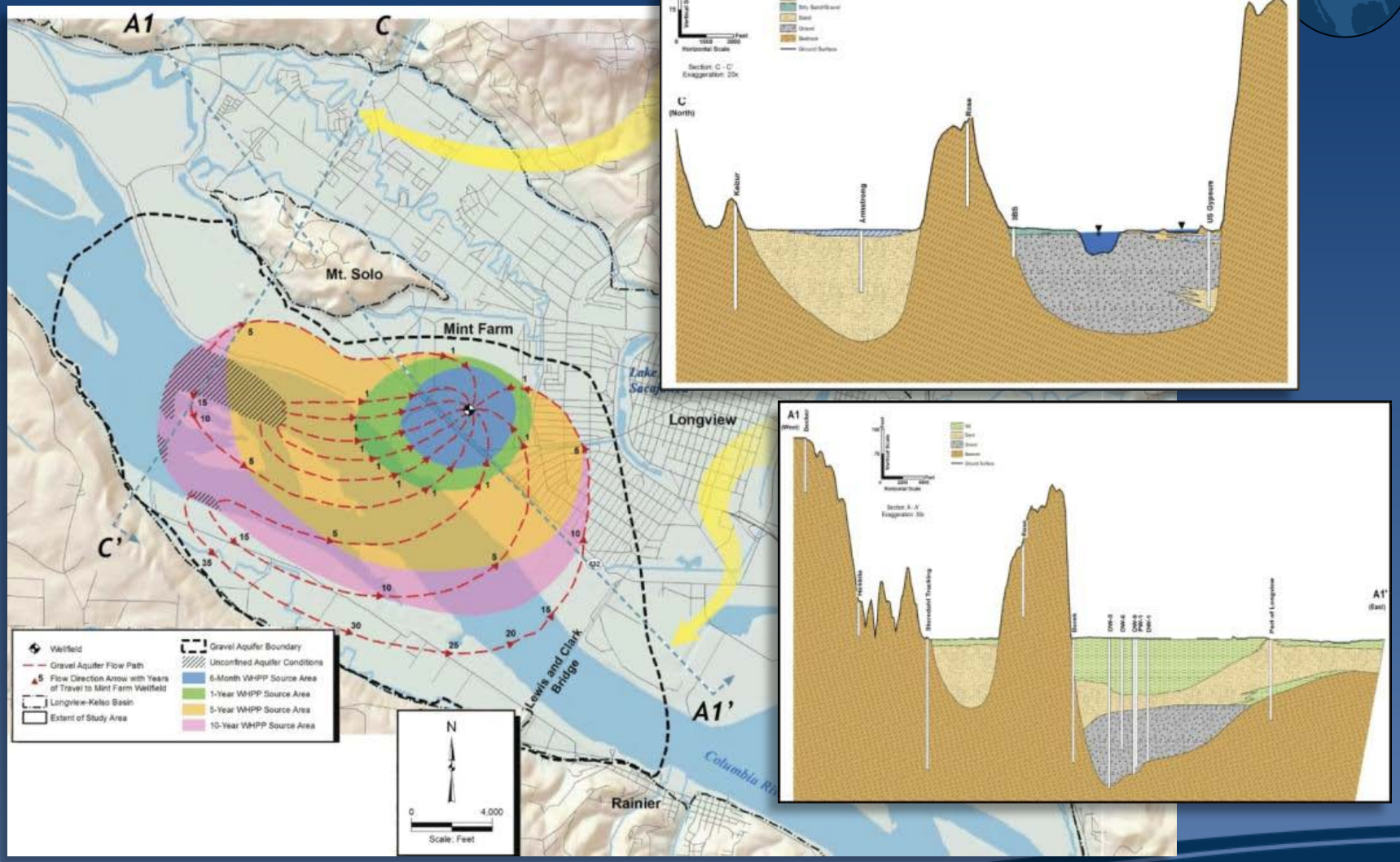
Production Well Installation and Testing

- Proposed wellfield site was relocated based on target aquifer thickness encountered during sonic drilling of monitoring wells
- 24” production test well was installed and pumped continuously at 3,900 gpm for 36 days (transmissivity >1M gpd/ft)

Groundwater Flow Paths



Overview of the Mint Farm Aquifer Source Area



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Summary of Hydrogeologic Characterization

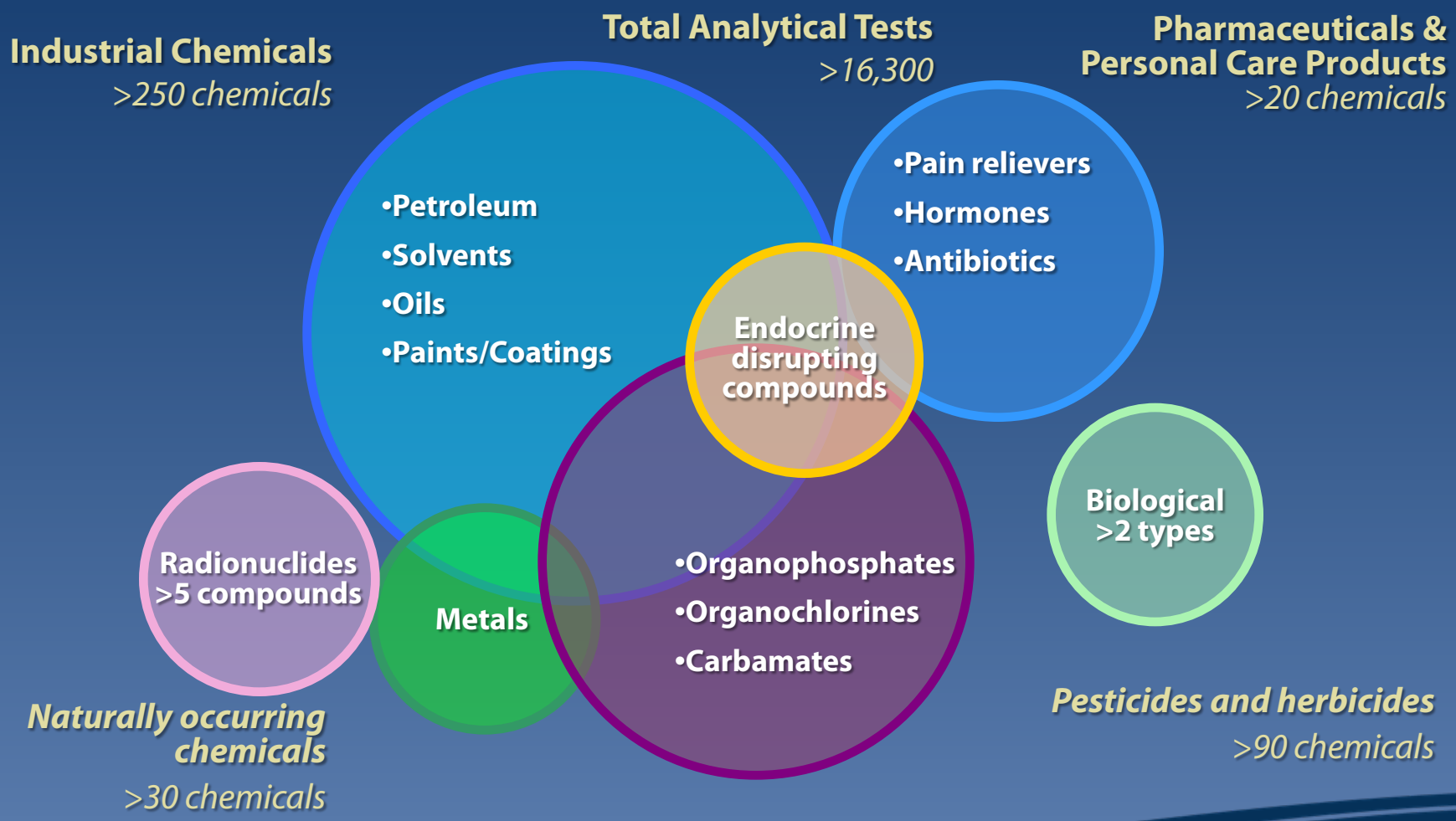
- The Mint Farm deep aquifer is capable of sustaining a safe and reliable long-term groundwater supply
- The Mint Farm deep aquifer is recharged by the Columbia River and yields large quantities of water
- Production wells will produce 4,000 gallons per minute
- The gravel aquifer beneath the proposed wellfield is protected from contamination at the surface by a thick confining layer of low permeability silts and clays

Characterize Water Quality of Groundwater Supply

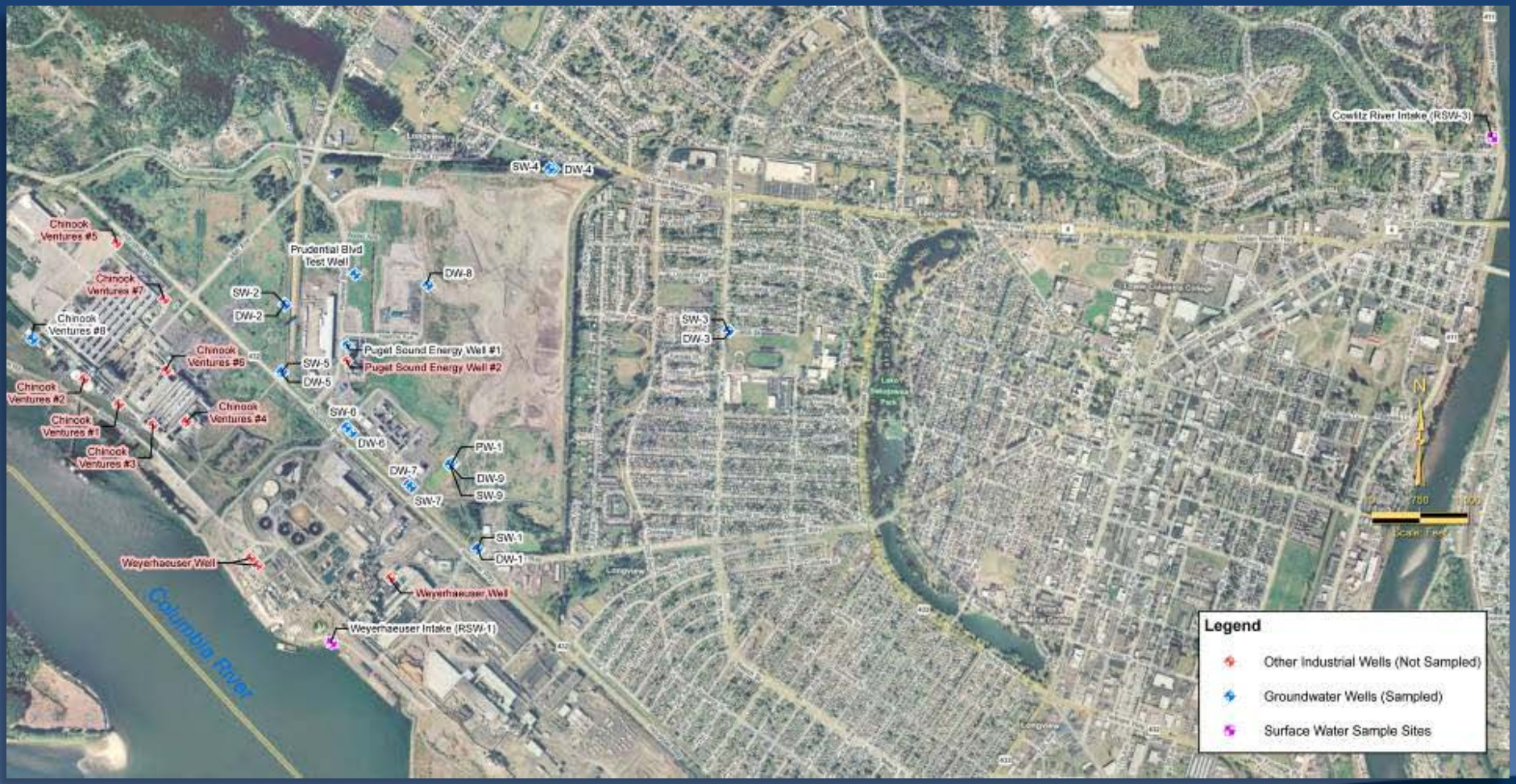
Water Quality Analysis Goals

- Evaluate soil and groundwater impacts within the Mint Farm property
  - Phase I / Phase II Environmental Site Assessment
- Analyze water quality in deep aquifer
  - Regulated and non-regulated constituents
  - Over 300 analytes, including contaminants of emerging concern
- Evaluate potential risks to human health

Categories of Analytes for Sampling and Analysis



Water Quality Sampling Locations



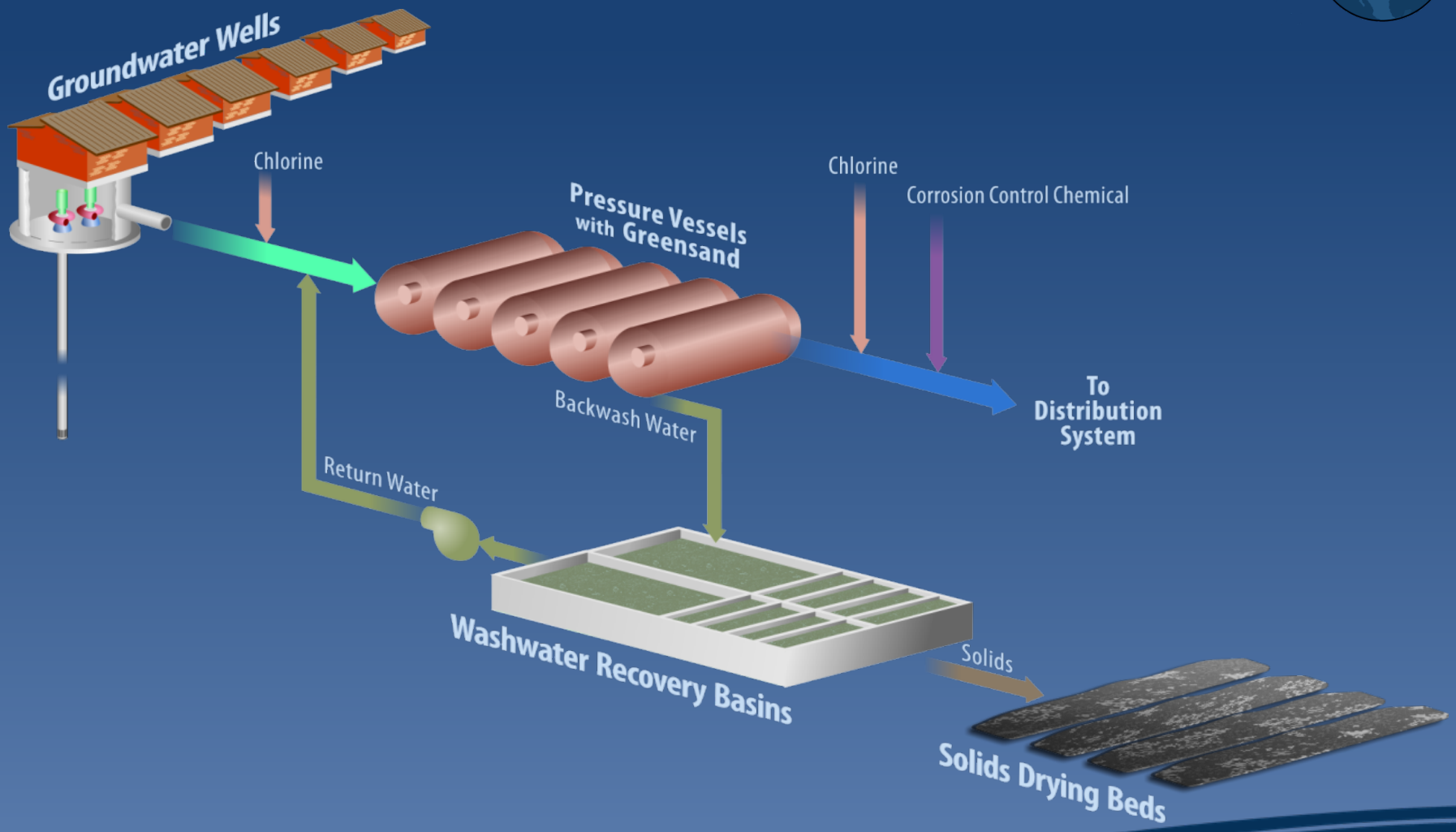
Water Quality Analysis Results

- Over 16,300 analytical tests performed
- No contamination was found in the deep aquifer
- Naturally occurring iron, manganese and arsenic will require treatment
- With treatment, the deep aquifer water will meet all regulatory water quality requirements

Key Step – Evaluate Treatment Alternatives

- Considered:
  - Membrane Filtration
  - Granular Media Filtration – greensand
  - Granular Media Filtration – greensand plus
  - Granular Media Filtration - silica sand
  - Rehabilitate existing conventional treatment

Granular Media Treatment Process



Granular Media Pilot Study: Pilot Filter Media Design

Parameter	Pilot Filter		
	Greensand	Greensand Plus	Silica Sand
Top Media	***Anthracite***	***Anthracite***	***Anthracite***
Depth (inches)	24	24	24
Effective size (mm)	0.95 - 1.05	0.95 - 1.05	0.95 - 1.05
Bottom Media	***Greensand***	***Greensand Plus***	***Silica Sand***
Depth (inch)	12	12	12
Effective size (mm)	0.30 - 0.35	0.30 - 0.35	0.52

Membrane Filtration

Advantages

- Modular process
- Footprint of filtration process will be smaller
- Positive barrier to particulate solids and most pathogens

Disadvantages

- Higher capital cost than greensand
- Higher operations and maintenance cost
- Finished water booster pumping required
- Complexity of mechanical, instrumentation and controls, and controls interface
- Proprietary vendor package
- Unproven in iron and manganese removal
- Unfamiliar operations requirements/operator skills
- Potassium permanganate is required

Greensand Filtration

Advantages

- Well-established, robust and proven process
- Distribution pumping not needed
- Major equipment, such as pressure vessels are provided by numerous vendors
- Media type can be changed in the future
- Lower capital cost than membranes
- Lower operations and maintenance cost than membranes
- Operations, maintenance and controls simpler than for membranes
- Fewer buildings required
- Operator skills required similar to those for existing plant

Disadvantages

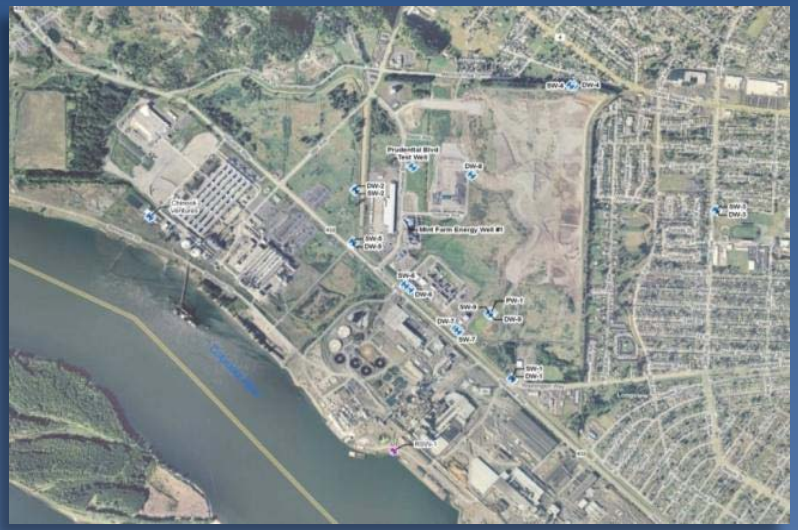
- Footprint of process may be larger than required for membranes

Comparative NPV Costs for Alternatives – 2009 Dollars

Cost Elements	Greensand Alternative	Membrane Alternative	Rehabilitate Existing Surface Water Plant
Comparative Construction Cost	$30,800,000	$38,800,000	$38,100,000
Comparative O&M NPV	$9,075,260	$22,316,212	$12,645,854
City Allied Costs	$687,000	$687,000	$1,840,000
Engineering Costs	$8,574,000	$8,574,000	$10,200,000
Property Acquisition	$2,000,000	$2,000,000	-
Other City Expenses	$235,000	$235,000	-
Total Comparative NPV	**$51,400,000**	**$72,600,000**	**$62,800,000**

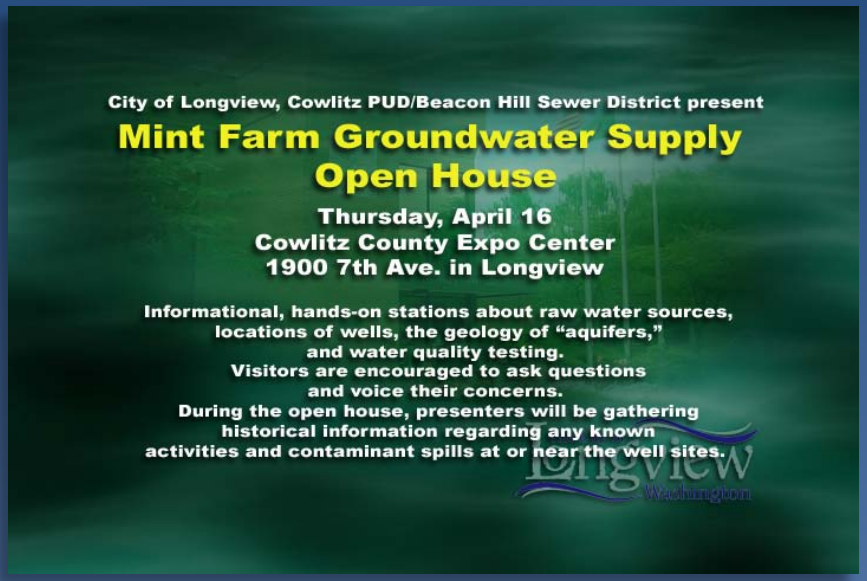
Public Concerns with Longview Project

- Potential contamination of groundwater
  - Long-standing industrial activities and historical agricultural uses
  - Unregulated and emerging contaminants
- Groundwater quality concerns
  - Taste, Odor, Iron / Mn / As
- Sustainability of aquifer source
- Effect on existing low-yield private wells



Key Step - Public Acceptance Strategy

- Present new source approach to public
- Characterize hydrogeology
- Analyze water quality
- Evaluate risk to human health
- Communicate findings to the public
- Overriding aspects:
  - Transparent
  - Thorough
  - Technically sound
  - Responsive to public concerns



Outreach Program to Customers

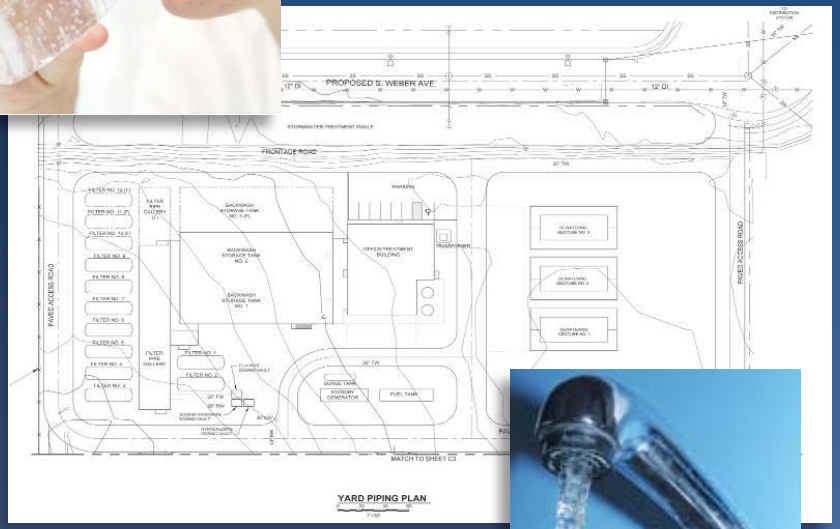
- Outreach to 47,500 customers
  - 8-page insert in local newspaper
  - Regular newsletters in monthly water bills
  - Backpack campaign
  - Presentations to local service groups
  - Live TV and radio interviews
  - Dedicated project website: www.mylongview.com
  - Two Open House events
  - Public workshop
  - Public taste test
  - Pilot treatment studies

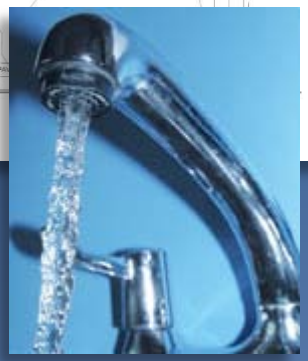
Basic Message

- The City is confident there is an abundant supply of high-quality groundwater at the Mint Farm Industrial Park that will ensure a safe and sustainable water supply for our community for years to come.

Success of Outreach Program

- Open house and workshop events were held to present very technical information to a non-technical audience
- Initial negative public perception shifted toward one of acceptance and support
- City Council formally approved the project on January 28, 2010





Last Key Steps in Changing the Source of Supply

- Conduct Preliminary and Final Design (after source and treatment identified)
- Construct and start-up the new facility
- During construction the most important step is introducing the “new” water to the “old” water
  - All at once
  - Blend and taper
  - Drain and refill

Questions?